**Grantee:** Intelligent Energy Systems
**Project Name:** Wind-Diesel Battery Hybrid for Kwigillingok

**Grant and Project# 7310051**

## Grant Completion Report

### Background:

Wind power can vary substantially minute to minute so that diesel engines cannot be turned off to save fuel and maintenance costs. A short-term battery connected in the power system would be able to provide the power to bridge low wind power events so that diesels shut off for longer periods.

### Activities:

Intelligent Energy Systems (IES) installed a lithium ion battery with inverters onto the power system at Kwigillingok to provide short term (<1/4 hour) of energy storage in the high penetration wind system.

### Project Costs:

| | Budget | Expenditures |
|---|---|---|
| Grant: | $1,025,750 | $1,025,750 |
| Match: | $30,000 | $30,000 |
| Total: | $1,055,750 | $1,055,750 |
| IES Additional Contributions | | $56,195.41 |

### Project Outcomes:

Project operated and data collected for more than a year showed the diesel and wind varying with a load regulator, battery and system frequency. There was an increase in diesel off/on events which shut reduce fuel costs. A larger battery should extend the diesel off periods and decrease maintenance costs along with the fuel. Rather a community saves (fuel savings vs battery cost) depends heavily on the cost of fuel.

### Problems Encountered:

Various electrical failures, new large loads, and utility operational issues prevented data from being collected at various periods.

### Conclusions and Recommendations:

Wind generation varies day to day, month to month, and year to year so comparing year to year wind vs diesel generation is complicated. In addition, the community saw a substantial increase in load from new infrastructure projects completed during the project period. Several wind events show system frequency remaining at 60Hz while the diesels are off. Frequency instability appears to happen at the start and end of the wind event while both the wind and diesels are operating. As the technology of lithium ion batteries matures there is likely to be increase usage in renewable energy systems.